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Randy Smidt
SpecPro Inc.
Contractor to
Fort Belvoir Environmental & Natural Resources Division, DPW



## En united

#### Fort Belvoir Briefing – Dallas Workshop





## Fort Belvoir Background

- Location
- Size
- Mission
- Buildings
- History
- Utilities
- Energy Team









## **NCR ESPC Project Summary**

Awarded to PGOV in June 1999 for a 20-year term

Capital Investment ~\$62 million ~\$28.5 million

Annual Payment ~\$10 million ~\$5 million

Construction
 1st 3 Years

Number of Buildings ~800 (out of 2400 surveyed) 260

• 100,000 Light Fixtures 60,000

• 630 Cooling System Retrofits 149

270 Heating System Retrofits

3 Large Central Steam Plants Modernized or Replaced 1

- Fort Belvoir accounts for ~50% of project
  - Project covers only some buildings on post, not all of them
  - All ESPC buildings have "dual" maintenance responsibility









### **ECM Savings and Cost**

ECM	Investment	<b>Annual Energy Savings</b>
ECM 1 - Cooling	\$10,253,506	\$478,075
ECM 2 - Cooling Controls	\$7,854	\$133,188
ECM 3 - VAV/VFD	\$1,596,150	\$236,118
ECM 4 - Economizer	\$572	\$848
ECM 5 - Heating	\$585,567	\$14,100
<b>ECM 6 - Heating Controls</b>	\$34,093	\$166,784
ECM 7 - Lighting	\$4,915,967	\$801,515
ECM 8 - EMCS	\$7,644,653	\$327,837
ECM 9 - Building Envelope	\$277,627	\$18,321
ECM 10 - Heat Recovery	\$70,180	\$3,846
ECM 11 - Water Conservation	\$924,377	\$117,304
ECM 12 - Central Plant	\$2,241,028	\$161,000
Site totals	\$28,551,574	\$2,458,936









## **ECM 1 - Cooling Unit Replacement**



Chiller – pre-retrofit: existing equipment is aging, in poor condition and utilizes ozone depleting refrigerants

New Chiller – replacement chillers are energy efficient and utilize environmentally friendly refrigerants











## **ECM 5 - Heating Unit Replacement**



# 23 Boilers have been replaced during ESPC construction











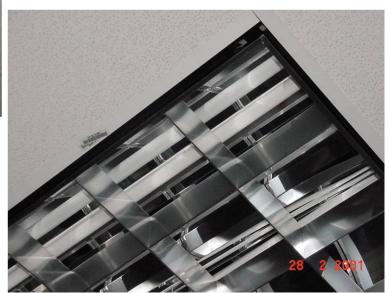
## **ECM 7 - Lighting Retrofit**



Older lighting fixtures utilized relatively inefficient T-12 bulbs with magnetic ballasts

# Approximately 60,000 lighting fixtures were retrofitted under the ESPC

Retrofitted fixtures combine energy efficient T-8 bulbs, electronic ballasts and reflectors to increase light output











## **ECM 8 - Energy Management Control System**













## **ECM 11 - Water Conservation Measures**



Old 6 gallon per flush water closet



**Approximately 4000 fixtures were** 

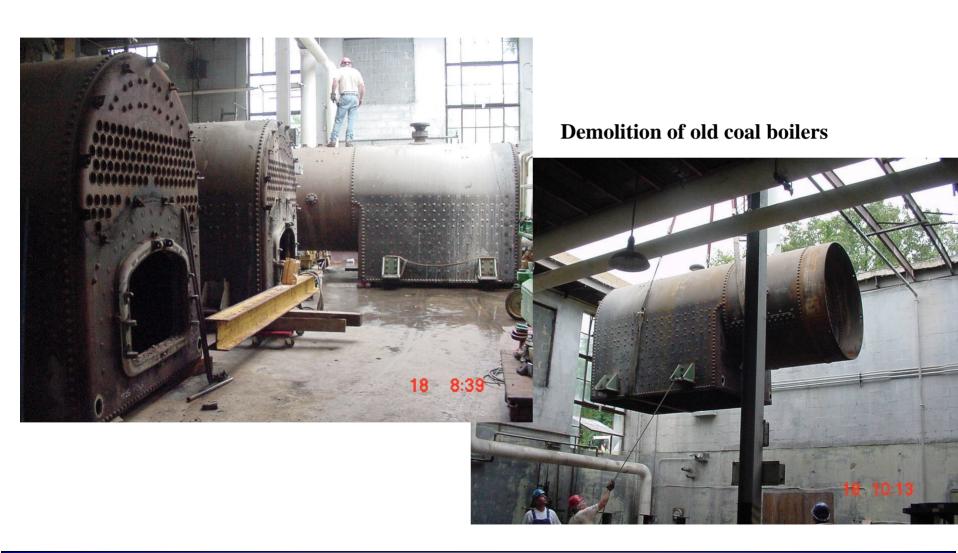








#### **ECM 12 – Central Boiler Plant Renovation**











#### **ECM 12 - Central Boiler Plant Renovation**



Delivery and installation of new natural gas fired low NO<sub>x</sub> boilers











#### **ECM 12 - Central Boiler Plant Renovation**



1422 Natural Gas Train



3 – 600 HP Cleaver Brooks CB-LE Boilers in operation









#### **ESPC Successes and Failures**

- Successes
  - Equipment and workmanship is of good quality as is O&M support
- Failures
  - Management of contract has been biggest issue









#### **UESC**

#### Test Case

- Recently began a small UESC project with our gas utility as a test case for a larger project encompassing about 50 buildings as an alternative to additional ESPC work (where no conflict with ESPC installed systems)
- Utility that already serves us has more vested interest, is more customer service oriented and has shown to be more innovative in coming up with solutions than ESCO

#### ECMs

- Retro-commissioning (particularly controls, VAV and economizers)
- TurboCore (frictionless magnetic bearing) chillers and compressor retrofits
- Solar Walls
- Solar Thermal preheat for air source heat pumps
- Lighting Controls including daylight dimming
- HVAC controls









## Challenges

- 9/11
- "Temporary" or Relocatable Buildings
- BRAC
- Utility Privatization

#### **Path Forward**

- Energy Awareness
- O&M Best Management Practices
- Sustainable Design/LEED
- Metering
- Continual Review









#### **END OF BRIEF**

## **INSTALLATION MANAGEMENT COMMAND**



"Sustain, Support and Defend"